

REMARKS

The applicant respectfully request reconsideration in view of the amendment and the following remarks. Support for newly added claim 36 can be found in claim 22. The applicant corrected β -rays and γ -rays. It appears that the Greek symbols inadvertently changed during one of the amendments. Support for newly added claims 37-39 can be found at page 33, lines 14-16 of the specification. Support for newly added claims 40-42 can be found in the specification at page 27, lines 1-3. The application contains a total of twenty claims. No new matter has been added.

Claims 16-22, 29 and 35 are rejected under 35 U.S.C. 102(e) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Suzuki et al., US 6,607,856 B2 (Suzuki). Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of US 2003/0031909 A1 (Gascoyne et al.). The applicant respectfully traverses these rejections.

The applicant's claimed invention is drawn to a proton-conducting polymer membrane based on polyvinylphosphonic acid obtained by a process comprising the steps:

- a) mixing a polymer and a vinyl-containing phosphonic acid,
- b) forming a two-dimensional structure using the mixture of step a) on a carrier, and
- c) polymerizing the vinyl-containing phosphonic acid present in the two-dimensional structure of step b), thereby producing a polymer interpenetrating network (IPN)

wherein the membrane has a thickness in the range from 15 μm to 1000 μm ,
wherein the product obtained in step (a) includes at least **10% by weight of vinyl-containing phosphonic acid**; and
wherein the intrinsic conductivity of the proton-conducting polymer membrane at **temperatures of 160°C is at least 0.001 S/cm** (emphasis added) (see claim 16).

The applicant believes that the claims have been distinguished by the amount of vinyl-phosphonic acid. The applicant requires a minimum of 10% by weight of vinyl-containing phosphonic acid and wherein the intrinsic conductivity of the proton-conducting polymer membrane at temperatures of 160°C is at least 0.001 S/cm. The applicant does not believe that Suzuki discloses these features.

Dependent claims 40-42 require either a minimum of 50% or 70% by weight vinyl-containing phosphonic acid and Suzuki clearly teaches away from these claims.

It is acknowledged that examples 18 and 19 of Suzuki disclose 10% by weight vinylphosphonic acid but they also require divinylbenzene monosulfonic acid. At page 6 of the Office Action, it appears that the Examiner is mixing up things a bit. The Examiner refers to "other monomer, such as divinylbenzenesulfonic acid" (see Section 10 of the OA). This is simply not examples that anticipates the applicant's claimed invention. Sulfonic acid groups require the presence of moisture in order to be proton conductive (as all Nafion based system) and therefore can not operated absent of moisture, which means their proton conductivity is lost with the moisture (above 100°C). Again, the applicant claims require wherein the intrinsic conductivity of the proton-conducting polymer membrane at **temperatures of 160°C** is at least 0.001 S/cm. The applicant has informed the undersigned that there are some systems which operate under pressure (to keep the moisture in) but they are also limited to about 120°C (otherwise the steam pressure would be too high). The instant materials uses phosphonic acid group which utilize the so called "Kreuer" mechanism for proton conductivity. These systems operate without moisture and hence have proton conductivity at 160°C. From this is it quite clear that the Examiner does not distinguish between (i) materials requiring moisture for proton

conductivity and (ii) materials which do not require moisture for having proton conductivity.

This is clearly a mistake by the Examiner not understanding the instant invention.

In summary, the membrane of Suzuki has only so called low temperature conductivity (caused by grafted – SO₃ groups) which require the presence of water is still correct. At 160°C no water is present and therefore the membrane of Suzuki has no conductivity from the grafted membrane. Since the 7% b.w. polyvinyl phosphonic acid content does not contribute to obtain a conductivity as instantly claimed, the products are being substantially different. This has been demonstrated by the Declaration filed April 30, 2009. **The applicant respectfully requests that the Examiner consider this Declaration.**

The teaching of the Suzuki is to trap metal impurities (by forming complexes) to avoid the formation of peroxides (which cause a shorter lifetime of the membranes due to degradation of the underlying membrane polymers) and not to obtain any high temperature conductivity.

The applicant believes that the secondary reference does not cure the deficiencies of the Suzuki. For the above reasons, these rejections should be withdrawn.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

A three month extension has been paid. Applicant believes no additional fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 15588-00029-US from which the undersigned is authorized to draw.

Dated: December 22, 2009

Respectfully submitted,

Electronic signature: /Ashley I. Pezzner/
Ashley I. Pezzner

Registration No.: 35,646
CONNOLLY BOVE LODGE & HUTZ LLP
1007 North Orange Street
P. O. Box 2207
Wilmington, Delaware 19899-2207
(302) 658-9141
(302) 658-5614 (Fax)
Attorney for Applicant